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Joint arrangement> Field of the Invention

The invention relates to a joint arrangement for a surface structure, such as a protecting plate, element or a like, which surface structure is meant particularly for covering of ground together with one or several other surface structures for temporary protecting, coating and/or like of the ground. In connection with each surface structure there has been arranged at least a joint arrangement for removable attachment of one or several adjacent surface structures to the same and a thermal insulation, that comprises at least one, essentially plastic based, such as cellular, expanded, foamed plastic structured or a like thermal insulation layer. The joint arrangement comprises a joint piece, that is to be coupled by means of a locking assembly, for coupling of the adjacent surface structures with each other essentially by corners of the same, which joint piece comprises known as such a right-angled, such as a square shaped frame part, whereby the locking assembly is arranged by projections placed at the corners of the frame part and preferably by recesses of the same shape, that are placed underside the surface structure. To the bottom surface of the surface structure there has been arranged preferably an integral support arrangement, that comprises a platform structure projecting from the basic wall thickness of the surface structure, such as the thermal insulation layer.

30 > Background of the Invention

For the purpose above, particularly for covering a field of grass or e.g. of ice, it is previously known to use most heterogeneous arrangements. For example covering elements being sold nowadays by the name TERRAPLAS represent particularly more developed solutions, that are made of plastics by injection moulding. To minimize mass of the covering element in question, it has been produced as a perforated

structure in a way, that not any actual thermal insulation effect may be achieved by the type of covering element. Correspondingly the support arrangements to support the covering elements against the ground must furthermore be attached to the covering elements by means of totally separate auxiliary devices and work stages. In addition to this locking arrangements connecting the covering elements to each other must be attached separately as well, so that a uniform and seamless covering may be achieved by the type of covering elements. The "perforated" structure of the type of covering element above does not either enable exploitation of a so called green house phenomenon particularly in connection with a grass field.

The perforated structure of the covering element in question is naturally advantageous with a view to the breathing of the ground, but the perforation causes in addition to a "rough" appearance and to those thermal insulation problems being described above such disadvantage as well, that garbage may get collected between the covering and the ground, which naturally eliminates good points of the covering element in question in this respect.

On the other hand it is previously known to use e.g. styrox particularly for covering of ice fields, that has been surrounded by both sides of the same by plywood plate. This type of solution is naturally not applicable as such to be installed particularly on a grass field, in case not totally separate foot structures are being used to raise the covering structure apart from the ground. On the other hand when being used in connection with an ice field, such problem of this type of solution has been found, that the plywood plates tend to freeze to the ice, that is why loosening of the same is laborious. In addition to that the type of constructions are very heavy, that is why

storing as well as use of the same for actual coating is disproportionately difficult.

On the other hand Finnish Patent Application No. 964199 discloses a protective structure, the thermal insulation of which comprises advantageously a plastic based, such as cellular, expanded, foamed plastic structured and/or a like thermal insulation layer, to the bottom surface of which there has been arranged an integral support arrangement, that comprises a platform structure projecting from the basic wall thickness of the thermal insulation layer particularly in order to achieve an air space between the protective structure and the ground under the same.

The solution in question is very advantageous in practice, which is due to the fact, that the thermal insulation placed between the ground and the protective structure gets more efficient thanks to the air space between the protective structure and the ground. In this case the feet, that are arranged as an integral platform structure directly to the bottom surface of the thermal insulation layer, prevent first of all so called burning of the grass that is left under the protective structure. In the application in question there has been shown furthermore an advantageous embodiment for coupling of the protective structures with each other by means of joint arrangements, that are arranged to the protective structures in an integral manner during manufacturing of the same and that operate e.g. by quick-locking principle. During tests in practice it has been found justified to improve particularly the joint arrangement coupling the protective structures with each other in such respect, that the protective structures could be on the other hand assembled as easily as possible but however locked in connection with each other reliably and seamlessly.

E.g. application document DE 27 17 625 discloses a covering assembly, that is applicable for temporary covering of ground in principle, wherein three or four covering elements being placed on the ground are being attached by means of a joint piece coupling the covering elements together by the corners of the same and that has holding rings of suitable shape for arrowlike locking pins, that are placed at the corners of the covering elements. The joint pieces being used in this solutions are placed, however, essentially underneath the actual covering elements, that is why they must be sunk into the ground, that is why they are not applicable as such to be used in connection with the type of thin surface structures as being discussed in this connection. On the other hand application document DE 25 58 967 discloses a base structure arrangement, that is to be put together e.g. by stone based elements, in which e.g. four bottom plates are being attached by corners of the same by means of a square shaped joint piece. At corners of the same there are pins, that may be attached to corresponding holes being placed at the corners of the bottom plate. This solution is not either applicable to be used for the type of use of the invention in question, because the bottom plates get supported by the corners of the same on the joint pieces. That is why with the type of solution as such, an entirety operating satisfactorily enough may not be achieved in connection with thin plastic structured covering elements being included to the invention in question. Furthermore application document DE 44 14 341 discloses separate joint arrangements to be used for connecting of concrete plates, that are intended for the corresponding purpose as the above application document. This solution is not as described above either applicable to be used for the type of use of the invention in question, whereby an adequately functioning entirety may not be achieved either, particu-

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larly when being used in connection with thin plastic structured covering elements.

Summary of the Invention

It is the aim of the joint arrangement according to this invention to achieve a decisive improvement for this purpose in other words particularly for making the installation of a removable covering structure more efficient and for securing staying together of the same and thus to raise substantially the level of prior art. To achieve this aim the joint arrangement according to the invention is primarily characterized in, that the frame part of the joint piece, that has an open center, such as a framework-like structure is arranged to pass the recesses existing in the platform structure, whereby the height of the recesses is arranged to correspond essentially at least to the thickness of the frame part.

As the most important advantages of the joint arrangement according to the invention may be mentioned easy installation of the surface structures enabled by a joint piece belonging to the same as well as simplicity and technical workability of the construction and manufacturing of the same as well. The invention enables first of all a very smooth covering, which is applicable for most heterogeneous purposes, that is carried out by joint pieces, that remain out of sight under the corners of the surface structures during the installation phase, whereby the surface structures to be coupled with each other may be connected to each other very quickly to form a surface structure, that is adequately smooth and seamless. As an advantageous embodiment the joint piece has a square shaped framework, by means of which e.g. four surface structures may be connected with each other by means of one joint piece operating by quick-locking principle, e.g. by cooperation of locking recesses, that are placed at the corners of the same, and projections, that are

placed at the corners of the joint piece. As an advantageous embodiment the frame part of the joint piece is arranged furthermore to pass the recesses of the platform structure in a way, that the total thickness of the surface structure is not increased therefor. Furthermore, when male couplers, that are placed advantageously at opposite edges of each surface structure, and female couplers, that are placed correspondingly at opposite edges, are being used and that are being placed furthermore at the bottom edges of the outer edges of the surface structures, the covering structure may be coupled in an extremely simple way by continuously "dropping" the following surface structure to be installed from above to its place and by connecting the same to the already installed surface structures by means of joint pieces by corners of the same.

Advantageous embodiment of the joint arrangement according to the invention are represented in the dependent claims related to the same.

> Brief Description of the Drawings

In the following description, the invention is illustrated in greater detail with reference to the appended drawings, in which

Fig. 1 shows one advantageous surface structure related to the joint arrangement according to the invention,

Figs 2a - 2c

show furthermore the surface structure being shown in fig. 1 as a detail seen from above (2a), and some advantageous coupling means arrangements as partial side-views for the part of female couplers (2b) and male couplers (2c), and

Figs 3a and 3b

show an advantageous joint piece belonging to the joint arrangement according to the inven-

tion as a side-view and seen from above.

> Detailed Description of the Invention

The invention relates to a joint arrangement for a surface structure, such as a protecting plate, element or a like, which surface structure is meant particularly for covering of ground together with one or several other surface structures for temporary protecting, coating and/or like of the ground. In connection with each surface structure there has been arranged at least a joint arrangement for removable attachment of one or several adjacent surface structures to the same and thermal insulation χ , that comprises at least one, essentially plastic based, such as cellular, expanded, foamed plastic structured or a like thermal insulation layer $1'$. The joint arrangement comprises a joint piece x , that is to be coupled by means of a locking assembly y , for coupling of the adjacent surface structures with each other essentially by corners of the same, which joint piece x comprises known as such a right-angled, such as a square shaped frame part, whereby the locking assembly " y " is arranged by projections $y1$ placed at the corners of the frame part and preferably by recesses $y2$ of the same shape, that are placed underside the surface structure. To the bottom surface of the surface structure there has been arranged preferably an integral support arrangement $1a$, that comprises a platform structure projecting from the basic wall thickness s of the surface structure, such as the thermal insulation layer $1'$. The frame part $x1$ of the joint piece x , that has an open center, such as a framework-like structure is arranged to pass the recesses $1a'$ existing in the platform structure $1a$, whereby the height of the recesses is arranged to correspond essentially at least to the thickness h of the frame part $x1$.

With reference particularly to figs 1 and 2, at each corner of the surface structure there has been arranged two recesses y2 one after the other at each side. This enables first of all that, that with only one joint piece x e.g. as shown in figs 3a and 3b it is possible to couple four surface structures with each other by the corners of the same or e.g. when a straight gable edge is being formed only two surface structures side by side.

Furthermore with reference to fig. 2a, the platform structure 1a is arranged by single and square shaped platforms 1a", that are placed advantageously all over the bottom surface of the surface structure, whereby the frame part x1 of the joint piece is arranged to embed preferably ^{four} ~~for~~ platforms 1a".

As an advantageous embodiment, the surface structures are square shaped, the dimensions of which are e.g. 1500 x 1500 mm, in which case the joint arrangement comprises coupling means z, such as male-female couplers z1, z2 being placed at the outer edges of the surface structure, that are carried out in the solution according to the invention advantageously in a way, that both the male and female couplers z1, z2 are arranged at opposite outer edges of the surface structure as shown in fig. 1. Furthermore as an advantageous embodiment with reference particularly to figs 2b and 2c, the male couplers z1 are arranged by projections being placed at the lower edges of the longitudinal p1 outer edges of the surface structure and correspondingly the female couplers z2 by recesses being placed at the lower edges of the crosswise p2 outer edges. In this way, particularly ~~the~~ coupling of the surface structures with each other is enabled in a way, that the following surface structure to be installed may be attached to the surface structures, that are installed already on the ground, after coup-

ling of the male coupler z1 existing at the outer edge of the same by lowering thereafter the outer surface being equipped with female coupler z2 essentially freely from above to its place and by locking the corners of the same to the above by means of joint pieces x.

Furthermore as an advantageous embodiment with reference to the views shown particularly in figs 2b and 2c, the male and female couplers z1, z2 comprise furthermore an auxiliary support/sealing assembly z3, that is carried out by such as counterpart surfaces or the like being placed at the upper edge of the outer surface of the surface structure at an angle α , that deviates essentially from the vertical direction, preferably at an angle of 15° and being directed to opposite direction and/or to the same direction in respect to the surface structure. With counterpart surfaces being directed to opposite directions it is first of all possible to achieve an auxiliary locking arrangement of a so called snap-joint type, and by means of counterpart surfaces being directed to the same direction as shown in figs 2b and 2c, the joint between the surface structures may get sealed.

It is obvious, that the invention is not limited to the embodiments presented or described above, but it can be modified within the basic idea even to a great extent. In this connection it is naturally possible to equip the surface structure to be used in connection with the joint arrangement more abundantly by exploiting e.g. separate support arrangements according to traditional practice or auxiliary reinforcing plates or the like in the surface structures. It is furthermore naturally possible to put up each single surface structure e.g. of several frame parts, that are connected to each other by suitable fastening arrangements either during manufacturing or that may be put

together during installation in site. In this connection the surface structures may be connected by other types of joint pieces also, deviating from the type of joint piece being shown above, which reach e.g. further to the center parts of the surface structure. It is furthermore naturally possible to use different kinds of coatings, also, for coating of the surface structure either by the upper surface or the bottom surface of the same. Correspondingly the surface structure as such or the thermal insulation layer belonging to the same may be made of EPS-material, such as expanded polystyrene foam or styrox, XPS-material, such as extruded polystyrene foam, EPP-material, such as expanded polypropylene foam or extruded polyethylene foam or e.g. extruded PVC-structural foam sheet. In a corresponding manner it is naturally possible to make the joint piece belonging to the joint arrangement of most heterogeneous materials, such as of wood, metal, plastics, reinforced plastics, ceramics etc.

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